22964

Occasional Papers Series

New Agricultural Technology

May 1975

Economics and Sector Planning Division
Office of Agriculture
Technical Assistance Bureau
U.S. Agency for International Development
Washington, D.C. 20523

OCCASIONAL PAPERS

from the

ECONOMICS AND SECTOR PLANNING DIVISION

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THE IMPACT OF

NEW AGRICULTURAL TECHNOLOGY

ON

EMPLOYMENT AND INCOME DISTRIBUTION

CONCEPTS AND POLICY

John W. Mellor
Cornell University

May, 1975

OCCASIONAL PAPER NO. 2

(A Summary Report on Contract AID/csd-2805)

Economics and Sector Planning Division
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SUMMARY

This paper is concerned with the relationship between agricultural production, employment, and income distribution. The first part of the paper develops a model of this relationship. The second part is concerned with policies and programs designed to increase agricultural production and rural employment.

Many growth theory models depict growth as a function of increase in the capital stock. Thus, they emphasize allocation of resources to capital goods industries at the expense of consumers goods industries such as agriculture. The development policies derived from capital oriented theories of growth have little merit if agriculture offers opportunities for efficiency increasing technological change.

The Mellor model of economic development begins with the assumption that technical change in agriculture is of a type which reduces costs per unit of output. (The Green Revolution technology packages are examples of this type of technological change.)

The model emphasizes: (a) the direct effects of new agricultural technology on employment; (b) the expenditure patterns associated with the increased incomes generated by new agricultural technology; and (c) the indirect increases in employment occuring in those industries experiencing increased demand.

The model is used with Indian data to estimate the equilibrium income and employment impacts of changes in agricultural technology in grain production. In the case of India it is found that with a 3.9 percent annual increase in food production, total employment increases 4 percent (food grain employment increases 3 percent, non-food grain employment increases 5.7 to 6.1 percent and non-agricultural employment increases 4 percent). Because of the relatively low labor content of new technologies, agricultural income grows at a slower rate than total income per capita, 1.5 percent as opposed to 2.9 percent. But this is an improvement over the static agricultural incomes experienced in India with its emphasis on capital intensive growth.

The simulation analysis demonstrates the feasibility of achieving substantial increases in the income and employment of the rural poor through a strategy which includes increased agricultural productivity, expansion of non-food grain agriculture and labor intensive small scale consumer goods manufacturing. It confirms the critical role of increased food production to provide the food needed to meet the demand generated by increased employment; and the large extent to which the increase in employment in agriculture is dependent on increased consumer expenditures which will also stimulate growth in the non-agricultural sectors.

Mellor argues that increased production of basic food commodities is essential to high employment policy because low income consumers spend the bulk of increments to their income on basic caloric sources such as grain. It follows that production oriented policies of agricultural research, education, and input marketing should be given first priority when emphasis is placed on increasing employment. Once income and production increasing technical change for the basic food grains is underway increased production of non food grain agricultural commodities, such as vegetables and livestock products, becomes an early priority in an employment oriented strategy.

Small farmers are central figures in a broad based employment growth strategy because of their relative large numbers and the danger of their falling into the landless class. Two policy element goals are important -- facilitating application of new technologies and fostering production of labor intensive commodities. It is broadly recognized that small farmers need better access to credit and inputs such fertilizer seed, pesticides, etc. Frequently overlooked is their aversion to uncertainty and risk which results in their rejecting crop combinations and technologies which in the long run provides them greater average incomes, but also entail greater variation in income. Policies to reduce risk include research to reduce variation in yields; provision of credit on terms which reduce risk, and income stabilization schemes.

Because the small farmer is basically a seller of family labor, increased labor intensity in agricultural production is central to his welfare. Increasing demand for labor intensive products is interdependent with increased productivity in the basic commodities and growth in the non-agricultural sectors. Small farmers will resist the adoption of labor intensive non-food grain enterprises for many of the same reasons they are reluctant to adopt new food grain technologies; lack of credit, lack of inputs, poor markets, risk uncertainty. Policies to promote these crops include research credit, access to input supplies, improved market facilities and processing.

Establishment of small scale labor intensive industry is required to provide employment opportunities in rural areas. Vigorous development of small-scale industry requires supporting policy of improved infrastructure for better working markets, imports of capital intensive new materials, ready supply of working capital, and rising consumer income.

Breakthroughs in agricultural technology followed by growth in local consumer goods industries, and agriculture together provide a basis for supporting rural infrastructure such as roads, electrification, water systems, etc. which each alone could not support. These in turn generate new income and employment opportunities further quickening the pace of growth. Furthermore, the size of these investments are so massive that a full-commitment to a rural oriented employment strategy is required--a partial one is unlikely to succeed.

Because the wealthy tend to consume capital intensive and imported goods out of new income, a strategy based on broad based rural employment requires a relatively even distribution of land ownership. Thus land reform may be necessary to the favorable implementation of this strategy.

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THE IMPACT OF NEW AGRICULTURAL TECHNOLOGY ON EMPLOYMENT AND INCOME DISTRIBUTION -- CONCEPTS AND POLICY

I. INTRODUCTION

For nearly all low income countries, technical change in agriculture is necessary to a broadly participatory, high employment strategy of economic growth. This key role for new agricultural technology derives from (1) the dominance of food in expenditure from newly rising incomes of low income people and (2) the generally high cost of increased agricultural production, unless new, efficiency increasing production technology is available.

However, the very process of technical change in agriculture, so necessary to participation of the poor in growth, may distribute initial increases in income largely to higher income owners of land. An initial failure of low income people to participate in the benefits of increased agricultural production may then reflect itself in little or no growth in effective demand for food, decline in agricultural prices and inadequate incentive for continued expansion of agricultural production. Fortunately, there are a number of indirect effects of technical change in agriculture which have potential for a more favorable outcome. Increased income of land owners may provide the basis of demand for goods and services which require additional labor in their production, with consequent distribution of benefits of growth to lower income people and hence the increased demand and price incentives requisite to continued growth in agricultural production.

Public policy can play an important role in determining the extent to which one or the other of these sequences is followed. Unfortunately, developing an appropriate policy is made difficult by the complexity of the various direct and indirect effects of tehcnical change in agriculture as well as by the inappropriateness to analysis of this set of problems of the bulk of current theory of economic growth in low income countries.

This paper draws upon a substantial body of research to analyze the complex relations of new agricultural technology as a basis for improved public policy to meet society's production and distribution objectives.1/ The first part of the paper deals broadly with the relation between agricultural production, employment and income distribution. The second part discusses specific policy issues within the broader context of technical change in agriculture and employment growth.

1/ See the following papers issued as part of AID Contract No. csd/2805. A broad overview of the policy construct for employment oriented growth is provided in Uma J. Lele and John W. Mellor, "Jobs, Poverty and the Green Revolution," International Affairs,Vol. 48, No. 1, January 1972; an attempt to place that construct in a more empirical context is povided in "Growth Linkages of the New Foodgrain Technologies," Indian Journal of Agricultural Economics, Vol. XXVIII, No. 1, Jan.-Mar. 1973; an analysis of existing theories of economic growth, their relation to employment oriented strategies and the appropriate direction for further analysis is provided in "Models of Economic Growth and Land Augmenting Technological Change in Foodgrain Production," Nurul Islam (ed.) Agricultural Policy in Development Countries, The Macmillan Press, Ltd., London, 1974; a mathematical model of growth which specifically analyzes biased technical change in agriculture is presented in Uma J. Lele and John W. Mellor, "Technological Change and Distributive Bias in a Dual Economy," Occasional Paper No. 43, Dept. of Agricultural Economics, Cornell University-USAID Employment and Income Distribution Project, June 1971; the approach of the model is further developed in a simulation model in "Modernizing Agriculture, Employment and Economic Growth: A Simulation Model," by John W. Mellor and Mohinder S. Mudahar, Occasional Paper No. 75, Dept. of Agricultural Economics, Cornell University-USAID Employment and Income Distribution Product, June 1974; and the simulation is applied in John W. Mellor and Mohinder S. Mudahar, "Simulating a Developing Economy with Modernizing Agricultural Sector: Implications for Employment and Economic Growth," Occasional Paper No. 76, Dept. of Agricultural Economics, Cornell University-USAID Employment and Income Distribution Project, June 1974.

II. THE INTERRELATION BETWEEN AGRICULTURAL PRODUCTION, EMPLOYMENT AND INCOME DISTRIBUTION

The complex interrelation between agricultural production, employment and income distribution is explored at three levels: growth theory, simulation models and statistical description of relationships. The emphasis on growth theory is in recognition of (1) the potentially minor role agriculture may play in determining the broad outlines of a nation's approach to economic growth; (2) the immense direct and indirect effects which agricultural technology may have on the pace of production growth and the distribution of that product; (3) the interrelationships which require a broad set of strategic changes if accelerated growth in employment is to be achieved; and, perhaps most important, (4) the role currently dominant theories of growth have played in directing policy towards the low employment, narrow participation approaches to growth which give little emphasis to the agricultural sector. Reference to a simulation model is further recognition of the complex interactions in both growth and distribution and the dual role of agriculture in providing to other sectors of the economy both wages goods and the income and demand for employment creating production. The collection and statistical analysis of data recognizes the paucity of information on many of the key relationships and the importance of specific data to understanding growth and distributive policies.

Current Growth Theory and Planning Models

Much of the currently ascendant theory of economic growth in low income countries as well as the bulk of the multi-sectoral planning models, which have been so important in planning, derive from the Harrod-Domar type growth models developed for analysis of growth in high income countries, and the Feldman-Mahalanobis models for autarchic growth of the Soviet type. These models depict growth as a function of increase in the capital stock. Thus, they emphasize allocation of resources to capital goods industries at the expense of consumer goods industries such as agriculture. This, in effect, requires minimization of employment because of the demand which increased employment creates for expansion of consumer goods industries in competition for resources with the favored capital goods industries. The industries emphasized in such approaches have also, in practice, provided little employment relative to their vast capital requirements.

It can be shown that the capital oriented theories of growth, as well as the consequent policies have merit if agriculture offers little opportunity for efficiency increasing technological change. This follows from the classic problem of diminishing returns and increasing costs when agricultural production is to be expanded by traditional methods on a fixed land area. Conversely, however, technical change in agriculture of a type which reduces costs per unit of output offers opportunity for a massive net addition to national income.

It is from this that much of the potential arises for growth linkages between agriculture and other sectors of the economy and for increased employment. And, it is those relationships which give such a crucial role to the research institutions which develop and refine new technologies for agricultural production.

It is unfortunate that the theories of economic growth which have little place for agriculture and little specific attention to employment are much more fully developed than alternative theories. In conceptualizing a process of economic growth with a major role for agriculture three key areas of relationships require emphasis: (a) the direct effects of new agricultural technology on employment; (b) the expenditure patterns incident to the increased incomes from new agricultural technology; and (c) the employment content in producing the goods experiencing increased demand. The following sections present data and analysis in each of these areas.

Direct Effects of Agricultural Technology on Employment

There is great variability among new agricultural technologies in the proportion of added output paid to labor, but, in general, the very technologies so essential to provide the food to back wages goods payments, provide only a small proportion of the increased income directly to labor through increased employment. Thus, from a survey of 14 diverse situations, typically only five to 15 percent of increased income from new technologies was represented by payment for increased labor (Table 1). In cases of widespread adoption of new agricultural technology these small proportions may still represent a significant aggregate increase in employment and incomes of the poor. Nevertheless, substantial additional sources of employment are needed not only to meet employment and welfare objectives but also to provide equilibrium between the increased output of agricultural commodities from these new technologies and the increased demand needed to maintain incentive prices for agricultural production. Put simply, if the added income from increased foodgrains production goes largely to the more well-to-do who are already eating well, output prices may decline for lack of offsetting demand and production incentives may thereby be lost. The requisite increase in demand for food may come from growth of employment in other sectors of the economy and consequent increase in incomes of laborers who, unlike landowners, spend a high proportion of increased income on food. Thus, increased employment is a virtual necessity to sustenance of the "green revolution," just as the "green revolution" is a necessity to sustenance of a high employment policy.

TABLE 1. Division of Increased "Payments" Between Labor and Other Inputs, Various High-Yielding Varieties and Areas.

Area	Increase in gross value of output		Increase in labor "payments" of		Percent increased output to labor[a]	Percent increased output to other inputs[b]
	Rupees per acre	Percent increase	Rupees per acre	Percent increase		
			Wheat			
Aligarh, U.P.	462	71	46	58	10	90
Varanasi, U.P.	620	65	11	15	2	98
Udaipur, Rajasthan	343	43	18	13	5	95
Punjab	450	100	56	42	12	88
			Kharif paddy			
West Godavari, Andhra Pradesh	269	38	32	17	12	88
East Godavari, Andhra Pradesh	216	33	20	13	10	90
Uttar Pradesh	1100	200	67	92	6	94
Tamil Nadu	550	100	33	20	6	94
Laguna, Philippines	374	72	3	3	1	99
Sambalpur, Orissa	404	95	36	28	11	89
			Rabi paddy			
West Godavari, Andhra Pradesh	562	86	39	16	7	93
East Godavari, Andhra Pradesh	761	153	39	30	5	95
Tamil Nadu	625	100	46	21	7	93
Gumai Bil, Bangladesh	948	208	302	125	32	68
			Bajra			
Kaira, Gujarat	300	85	39	27	13	87

[a]Labor "payment" is defined as physical labor input (family and hired) in man-days at a constant wage.

[b]Other inputs "payments" defined as gross value of output minus share to labor.

Source: Mellor, John W. and Uma J. Lele, "Growth Linkages of the New Foodgrain Technologies," Indian Journal of Agricultural Economics, Vol. XXVIII, No. 1, January-March 1973, Table II, p. 39.

The Expenditure Patterns from Increased Rural Incomes

Detailed analysis of expenditure patterns by income class confirmed that increased employment and incomes of the laboring classes are to a large extent spent on agricultural products. In India, for the lower two deciles in total expenditure, 60 percent of increments to income were spent on foodgrains alone and 85 percent on all agricultural commodities (Table 2). Thus a high employment policy must be backed by a commensurate and massive increase in agricultural production, while demand for increased agricultural production is readily generated by increased employment.

A striking finding from analysis of expenditure pattern is the major role played by nonfoodgrain agricultural commodities. Across nearly all income classes, on the order of 30 percent of added income is spent on these commodities, of which a major component is livestock products and vegetables. For example, in India, in all but the lowest income decile, milk and dairy products are about 50 percent more important than textiles in incremental expenditure patterns.

In general, the nonfoodgrain agricultural commodities are labor intensive in production. This, in the context of rising rural incomes and appropriate development policy, these commodities offer potential for massive increase in employment within the rural sector. It follows that agriculture itself may through these secondary effects play a major role in providing increased employment, but, conversely, efforts to expand employment in agriculture through intensification in nonfoodgrain agricultural commodities must be supported by increased demand from higher consumer incomes. Thus an important relationship between consumption, use of labor and growth is established and it can be seen that employment policies need to be coordinated over a broad range of efforts.

A clear potential is also shown for rising rural incomes to generate increased demand for relatively labor intensive manufactured goods, and from that a potential is established for development of industries which previously lacked either a demand or production rational for location in rural areas. Thus a basis is created for development of market towns or centers of growth, with attendant potentials to tap rural sources of capital as well.

Table 3 illustrates through two cases how aggregate expenditure of Rs. 2400 million varies substantially according to the distribution of income. The Rs. 2400 million is roughly equivalent to a five percent addition to foodgrain production in India at the price levels of the late 1960's.

TABLE 2. Division of Incremental Expenditure Among Expenditure Categories, by Rural Expenditure Class, India, 1964/65

	Decile[a]						
	Bottom Two	Third	Fourth and Fifth	Sixth, Seventh and Eighth	Ninth	Lower One-half of Tenth	Upper One-half of Tenth
Mean per Capita Monthly Expenditure (Rs.)	8.93	13.14	17.80	24.13	30.71	41.89	85.84
Allocation of an Additional Rupee of Expenditure: b/							
Agricultural Commodities	0.79	0.69	0.59	0.52	0.46	0.40	0.33
Foodgrains	0.59	0.38	0.25	0.16	0.11	0.06	0.02
Nonfoodgrains	0.20	0.31	0.34	0.36	0.35	0.34	0.31
Milk & milk products	0.07	0.11	0.12	0.13	0.13	0.12	0.09
Meat, eggs & fish	0.02	0.03	0.03	0.03	0.03	0.03	0.02
Other foods	0.01	0.05	0.07	0.09	0.10	0.12	0.16
Tobacco	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Vanaspati	-	0.01	0.02	0.02	0.02	0.02	0.01
Other oils	0.05	0.05	0.04	0.04	0.03	0.02	0.01
Sweeteners	0.04	0.05	0.05	0.04	0.03	0.02	0.01
Nonagricultural Commodities	0.21	0.31	0.41	0.48	0.54	0.60	0.67
Textiles	0.09	0.08	0.07	0.08	0.07	0.06	0.07
Cotton textiles	0.09	0.08	0.07	0.06	0.06	0.05	0.03
Woolen textiles	-	-	-	0.01	0.01	0.01	0.02
Other textiles	-	-	-	0.01	-	-	0.02
Nontextiles	0.12	0.23	0.34	0.40	0.47	0.54	0.60
Footwear	-	0.01	0.01	0.01	0.01	0.01	0.01
Durables & semi-durables	0.01	0.01	0.01	0.02	0.02	0.03	0.05
Conveyance	0.01	0.01	0.02	0.02	0.03	0.05	0.10
Consumer services	0.02	0.02	0.02	0.03	0.03	0.04	0.06
Education	0.01	0.01	0.02	0.03	0.03	0.05	0.11
Fuel & light	0.07	0.07	0.06	0.05	0.05	0.04	0.03
House rent	-	0.01	0.01	0.02	0.03	0.04	0.08
Miscellaneous	-	0.09	0.16	0.22	0.27	0.28	0.16
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 2. (cont.)

a/ The deciles refer to the following expenditure classes:

Bottom two deciles: mainly landless agricultural and nonagricultural laborers;

Third decile: laborers with less than one acre;

Fourth and fifth deciles: farmers with 1-5 acres;

Sixth, seventh and eighth deciles: farmers with 5-10 acres:

Ninth decile: farmers with 10-15 acres;

Lower one-half of tenth decile: farmers with 15-30 acres;

Upper one-half of tenth decile: farmers with 30+ acres.

b/ Definitions of expenditure categories:

a) Other foods include spices, salt, vegetables, fruits and nuts, beverages, refreshments, jam, jelly, pickles.

b) Durables and semi-durables mainly include furniture, kitchen equipment, sewing machines, electric fans, transistor radios, radios, bicycles, motorcycles, motor cars, etc.

c) Conveyance include expenses on transportation by bus, taxi, train, airplane, steamer, boat, motor car, motorcycle, scooter, rickshaw, bullock cart, horse cart, including conceyance charges incurred by children for going to school.

d) Consumer services include medical care, litigation and domestic work, barbers, washermen, dry cleaners, carpenters, blacksmiths, priests, plumbers, gardeners, gold and silversmiths, and drivers.

e) Education includes expenses on books, journals, newspapers, periodicals, stationery, school fees, private tutor's fees.

f) House rent includes expenditure incurred on rented house. No imputation of rent for residential houses owned by the sample households was made.

g) Miscellaneous includes biscuits and confectionery, intoxicants, pan, medicines, toiletry, sports and amusements, sundry goods (details unspecified in the study), ceremonials and gifts. This item is estimated as a residual.

SOURCE: Mellor and Lele, op. cit., Table III, p. 41; original data estimated from the functions fitted to data from NCAER, "All-India Consumer Expenditure Survey," 1964-65, Vol. II, New Delhi, 1967; computations made by Bhupat Desai, for which see Occasional Paper No. 54.

In one case, consistent with many of the new high-yielding foodgrain varieties, we assume 10 percent of the Rs. 2400 million is expended by the laboring classes (the lower three deciles in total expenditure) and 90 percent is expended by the owner-cultivator class (the sixth, seventh and eighth deciles). As an alternative, we assume that 80 percent of the income is expended by the laboring classes and 20 percent by the owner-cultivator class. The latter is analagous to the probable division of expenditure in the case of traditional, labor intensive increases in production.

In the first case, while all the income is assumed to be derived from increased foodgrain production, only 13 percent of the added "expenditure" is allocated to food grains and hence is not sold out of the foodgrains sector. In the second case, 37 percent is allocated to foodgrains. Presumably in both cases all the food grains produced will be consumed. The first involves much more complex production and trading relations.

The increment in demand for nonfoodgrain agricultural commodities has a somewhat different composition depending on the distribution of income. The increment in demand for milk and milk products is about 20 percent greater in the distribution that favors the upper income groups than that which favors the lower income groups. The increment in demand for "other" foods, which includes fruits and vegetables, is 50 percent greater in the distribution toward the landowning classes than for that toward the laboring classes. In contrast, in the distribution toward the laboring classes, the demand is relatively larger for other edible oils and sweeteners.

Striking differences occur in demand for nonagricultural commodities. While the increment in demand for cotton textiles actually is 15 percent less in the distribution toward the rich as compared to the distribution toward the poor, the increment in demand for woolen and "other" textiles is more than four times larger in the "rich" case compared to the "poor." The increment in demand for miscellaneous goods, largely consumer nondurables is nearly twice as great in the "rich" case as compared to the "poor."

These are of course the consumption patterns that would occur if the underlying demand functions did not change and if adequate planning allowed the desired quantities to be produced and supplied without change in relative prices. Effective and appropriate policy needs to be based on knowledge of these potentials for changes in expenditure pattern and of the institutional and other policies needed to facilitate or inhibit particular changes.

TABLE 3. Distribution of Rupees 2400 Million Expenditure Assuming Two Different Distributions of Income.

Items	10% of expenditure by landless labor and 90% by owner-cultivator			80% of expenditure by landless laborers & 20% by owner-cultivator		
	Laborers expenditure (million rupees)	Cultivators expenditure (million rupees)	Total expenditure (million rupees)	Laborers expenditure (million rupees)	Cultivators expenditure (million rupees)	Total expenditure (million rupees)
1. Food grains	101	324	425	806	72	878
2. Milk & milk products	24	281	305	192	62	254
3. Meat, eggs & fish	8	65	72	58	14	72
4. Tobacco	2	43	45	19	10	29
5. Vanaspati	2	43	45	19	10	29
6. Other edible oils	12	64	77	96	14	110
7. Sweeteners	12	86	98	96	19	115
8. Other foods	12	194	206	96	43	139
9. Cotton textiles	22	151	173	173	34	206
10. Woolen textiles	-	22	22	-	5	5
11. Other textiles	-	22	22	-	5	5
12. Footwear	-	22	22	-	5	5
13. Conveyance	2	43	46	19	10	29
14. Consumer services	5	65	70	39	14	53
15. Education	2	65	67	19	14	34
16. Fuel & light	17	130	146	135	29	163
17. House rent	-	43	43	-	10	10
18. Durables & semi-durables	2	43	46	19	9	29
19. Miscellaneous	17	454	470	134	101	235
TOTAL	240	2160	2400	1920	480	2400

a/ Landless laborers defined as the lowest three expenditure deciles and owner-cultivator as the sixth, seventh and eighth expenditure deciles.

Source: Mellor and Lele, op.cit., Table V, p. 45

Simulation of Demand Effects of Increased Rural Income

The complex relationships delineated by the analysis of income distribution and employment effects are examined in the context of a simulation model to explore the equilibrium positions, between supply of wages goods from agriculture, the increase in employment, the growth in income and demand for various commodities and the employment so generated. The initial purpose of the model is to check consistency between production of foodgrains, employment and demand for foodgrains and to examine the division of direct and indirect employment effects between sectors, with emphasis on the potential for employment expansion in the nonfoodgrain agriculture sector. The simulation analysis confirms the critical role of increased food production to provide the wages goods to support increased employment; the potential for agriculture itself to provide a substantial portion of that increase in employment; and the large extent to which the increase in employment in agriculture is dependent on increased consumer expenditures which will themselves stimulate considerable growth in the nonagricultural sectors as well.

The simulation model raises the question, with a given rate of growth of foodgrain production, what rate of growth in employment can be sustained and what will be the division among production sectors of that employment increase. That determination requires knowledge of the relationship between per capita consumption of foodgrains by the laboring classes and the level of their incomes -- as income rises, per capita consumption rises and a given increment of foodgrain production will support a lesser increment of employment than previously. It is also necessary to know the characteristics of the technology for increasing foodgrain production and the labor productivity in the other sectors. The former determines the labor used directly in foodgrains production, as well as the distribution of income among income classes, thereby determining the potential direct increase in employment.

The model as currently formulated concentrates on the foodgrain and nonfoodgrains agricultural sectors and calculates nonagricultural employment as a residual. Using base line data closely related to India, assumption of a technology system heavily influenced by the new high-yielding crop varieties applied at a rate to provide growth of foodgrains production of approximately 3.9 percent per year and the consumption relationships shown in Table 2, we find that total employment grows at a rate slightly higher than four percent per year. With a labor force growth rate of two and a half percent, such a rate of growth employment would allow absorption of all labor force growth plus an additional equivalent of 30 percent of the base period active rural labor force in a period of 12 years. Although the supply of labor in low income countries is highly elastic it still seems likely that that order of employment growth would result in rising real wage rates in addition to increasing average employment per person and per family.

With the given technical assumptions the rate of growth of employment in foodgrains production is about three percent per year; and, in the initial years, 22 percent of the added employment is in that sector, despite the relatively low employment content of the new agricultural technology. The rising incomes stimulate a rapid growth in demand for output from the nonfoodgrains agricultural sector of initially 5.7 percent, increasing gradually to 6.1 percent per year, and thereby absorbing approximately 22 percent of the added employment. Thus, the two agricultural sectors initially absorb about 44 percent of the added employment, about equally divided between foodgrains and the rest of agriculture - the first determined by technology and the second by the indirect effects of increased consumer income and expenditure.

The residual potential for employment allows a four percent rate of growth of employment in the nonagricultural sector. That is a rate slower than that actually achieved within the Indian Third Plan period. But, in this case, employment growth in agriculture is faster and there is consistency with the foodgrain supply. The rate of output growth in the nonagricultural sector would depend on the rate of investment in that sector, and the consequent increase in labor productivity. It would, perhaps, be reasonable to expect output to rise at a rate of eight percent per year if employment were rising at four percent. All these growth rates seem feasible with reinvestment of the bulk of returns to capital or industrial profits at a rate of return on capital of eight percent or higher. Hence, in this context, it seems unlikely that capital would be limiting to employment growth assuming no excessive leakage into public sector consumption and a potential to trade for capital intensive products. These rates would provide an overall rate of growth of output of about 5.4 percent per year and a rate of growth of per capita income of 2.9 percent per year. The overall growth rate is a weighted average of the three sectoral growth rates and the per capita rate is adjusted by subtracting the population growth rate.

The rate of growth of per capita laboring class incomes and expenditure is a function of the employment growth rate minus the labor force growth rate, until "full employment" is reached - or in this case, about 1.5 percent per year. Thus, income of other classes are growing significantly faster than laborer's incomes. However, that is a vast improvement for the laboring class over the capital intensive pattern of growth, which has historically given them no increase in per capita real income. Also, of course, the extent to which expenditure patterns among income classes diverge depends on the extent to which increased incomes of the nonlaboring classes are reinvested. Among the peasant farming and small business classes such reinvestment is likely to be high in the growth climate portrayed.

The growth system is shown to be quite sensitive to change in the rate of growth of foodgrains production. Thus a decline of the agricultural production growth rate to 3.3 percent, other assumptions approximately the same, reduces the rate of growth of employment to about 3.4 percent per year with about 30 percent of the increase in employment in the foodgrains sector itself. Production of nonfoodgrains agricultural commodities grows at a rate of about four percent per year. The rate of growth of per capita income of the laboring classes reduces to one percent per year.

Strikingly, if the technology of food grains production swings more heavily away from traditional techniques so that a slightly higher than four percent rate of growth of food grains output is achieved but with the bulk of the growth from modern, high-yielding variety technology, then the overall rate of growth of employment is of course the same, but 30 percent of this is initially in the foodgrains agricultural sector and the rate of growth of nonagricultural employment is initially 6.2 percent, declining gradually to 4.5 percent per year.

Thus we see clearly that consistency between growth rates of foodgrain production, employment and capital supplies and requirements are quite interdependent and sensitive to each other at approximately current levels of production.

Capital Intensity Implicit in Increased Rural Expenditure

Change in the level and distribution of income and expenditure has a potential to increase the labor intensity of production processes. It may do so by increasing the relative importance of goods and services produced by labor intensive processes, that is by changing the structure of industrial production, as well as by contribution to an environment conducive to growth of small scale industry of a generally labor intensive nature. Rapid growth in agricultural production through technical change places heavy demands on a nation's capital resources both directly in the large capital requirements of technical change itself and indirectly by releasing the wage goods constraint on employment and thereby requiring the capital for creating many more jobs.

Even though the secondary data available for this purpose were meager and difficult to interpret, two reassuring points are apparent from comparative data on capital-labor ratios. First, capital-labor ratios are relatively low in the consumer goods industries experiencing the largest increase in demand form the increased rural incomes associated with technical change in a peasant agriculture (Table 4). Thus, food processing, textiles, footwear and furniture manufacture are amongst the least capital intensive industries.

Table 4. Capital-Labor Ratios and Value Added, by Industrial Sector, India, 1960-1964

Industry	Productive capital per employee (Rupees)	Plant mach. & tools per employee (Rupees)	Percent of Total value added 1960	1964
Tobacco Mfrs.	3,856	399	2.0	1.3
Mfr. of Footwear, Other Wearing Apparel & Made-up Textile Goods	4,182	774	0.1	0.2
Textile Mfrs.	4,877	2,219	31.8	26.0
Mfr. of Leather & Fur Products Except Footwear & other Wearing Apparel	6,011	947	0.3	0.2
Mfr. of Wood & Cork; Mfr. of Furniture & Fixtures	6,095	1,648	0.8	0.7
Miscellaneous Mfg. Industries	6,823	2,599	1.1	1.2
Food Mfg. Industries, Except Beverage Industries	8,077	3,029	12.0	8.1
Mfr. of Transport Equipment	8,551	2,949	10.2	9.7
Mfr. of Nonmetallic Mineral Products Except Products of Petroleum & Coal	9,054	4,053	4.4	3.7
Mfr. of Metal Products except Machinery & Transport Equipment	9,185	3,048	2.1	2.3
Mfr. of Paper & Paper Products; Printing, Publishing & Allied Industries	11,308	6,181	4.4	4.1
Mfr. of Machinery except Electrical Machinery	11,453	4,685	3.2	5.3
Mfr. of Rubber Products	13,076	4,643	2.6	1.9
Mfr. of Elec. Mach., Apparatus, Appliances & Supplies	13,921	4,399	3.3	4.2
Beverage Industries	15,578	5,487	0.3	0.4
Mfr. of Chemicals & Chemical Products	26,436	11,123	8.3	8.4
Basic Metal Industries	35,035	22,109	8.7	12.8
Electricity, Gas & Steam	52,171	38,882	2.6	8.2
Mfr. of Products of Petroleum & Goal	126,056	57,793	1.8	1.3
Total			100.0	100.0

Source: Government of India, Annual Survey of Industries, Vol. 1, 1964.

Second, while there is considerable variation within these industries, important industries with high capital-labor ratios are primarily those catering to demand from urban consumers (Table 5). For example, the capital-labor ratio for milk and milk processing is high and comparable to that of the chemical industry. Similarly, the ratio for the cigarette industry is somewhat lower than for milk and milk products but much higher than that for several other major consumer goods industries and greatly higher than that for traditional forms of tobacco products. Under small town and rural conditions these products or their close substitutes are consumed in a form requiring much less capital intensity in their production. Thus, the structure of demand may influence the choice of technique as well as influencing the scale of production of many of these consumer goods. Through both of these factors, the structure of demand associated with rising rural incomes may encourage a more decentralized and labor-using pattern of industrialization. That pattern may, however, require considerable facilitative action with respect to the rural infrastructure.

Tables 4 and 5 also present data for proportion of value added in manufacturing contributed by each of the industry categories for India in 1960 and 1964. In this period the industries which would experience sharp increase in demand from increased rural incomes, actually experienced a relative decline in importance. Particularly large relative declines occurred in the low capital-labor ratio agricultural processing and textile industries. As a consequence, average capital-labor ratios increased markedly and the employment content of growth decreased.

Thus, for India, the effect of change in industrial structure alone was sufficient to increase the average capital-labor ratio by 20 percent from 1960 to 1964 (data from Annual Survey of Industry). The change in average capital-labor ratio was calculated by assuming the capital-labor ratio for each industry constant at its 1964 level and then weighting that ratio by the proportion of value added contributed by each industry for each of the years measured. Thus, change in the ratio by this calculation is entirely due to change in the proportion of value added by each industry. Major increases in rural incomes through increased output of new foodgrain varieties may reverse this tendency and change the structure of demand and output growth toward more labor intensive industries.

More intensive analysis of change in industrial structure in India confirmed that the employment content of past industrial growth has been strongly skewed towards large scale capital intensive industry; that this was the result of the strategy of growth; and, that the trend could be reversed in complement with a rural development strategy which raises incomes through efficiency increasing technological change in agricultural production.

TABLE 5. Capital-Labor Ratios and Value Added for Various Consumer Goods Industries, India, 1960-1964

	Productive capital per employee	Plant mach. & tools per employee	% of all industrial value added 1960	1964
Milk Foods & Malt Foods	26,446	12,949	0.1	0.1
Other Foods				
Processed Fish & Seafood	6,498	4,249	-	-
Processed Fruits & Vegetables	5,871	1,678	-	0.1
Tobacco				
Biri	816	33	0.2	0.0
Cigarette	17,798	2,056	1.2	1.2
Snuff	10,754	1,267	-	-
Jerda	3,658	476	0.1	-
Other Tobacco	1,653	135	(not comparable)	
Edible Oils	7,635	2,380	0.6	0.4
Other Oils				
Vanaspati	14,010	4,299	0.9	0.4
Sweeteners				
Sugar	12,107	6,113	4.4	3.0
Gur	1,961	976	-	-
Cotton Textiles	4,843	2,382	23.7	17.7
Other Textiles				
Wool	9,259	2,729	0.7	0.8
Art Silk	11,427	5,274	1.3	2.2
Footwear	4,821	610	-	0.1

Source: Government of India, Annual Survey of Industries, Vol. 1, 1964.

Small scale industry represents an important potential source of employment growth which itself may be located more readily in rural areas experiencing rapid increase in incomes and consumer demand. Analysis of small scale industry confirms its potential for labor intensive operation and showed a heavy dependence on capital intensive large scale industry for inputs. It is this latter which, on the one hand, limits the employment potential for small scale industry in the autarchic growth strategies of the formal type, with consequent loss of opportunities for rural industries as well as employment growth; but which , on the other hand, argues for increased foreign trade as a means of importing capital intensive intermediate products to facilitate growth of small scale industries and for exports of labor intensive products in payment. Thus, there is a further interdependence between policies for agricultural employment, industry and trade.

III. POLICIES FOR EMPLOYMENT ORIENTED GROWTH

The growth relationships of a rural and employment oriented growth strategy suggest a wide range of policy issues and actions. Ten such issues are treated below. In each case the policy recommendations flow from the interrelations discussed in the preceding section and are supported, in addition, by specific empirical data.

1. Priorities and Sequencing for Agricultural Production Increase

The preceding analysis shows increased production of basic food commodities as essential to a high employment policy for the simple reason that low income consumers spend the bulk of increments to their income on basic caloric sources such as grain. Similarly, technological change of yield increasing types is crucial not only as a means of increasing production, but also as a means of providing the net increase in national income which can be so stimulative to growth in other sectors of the economy, with consequent profound implications to employment policy. Thus, pursuit of the "green revolution," much critical literature to the contrary, is for most countries a necessary condition to increased employment and welfare of the poor.

It follows that the production oriented policies of agricultural research, education, input supply, etc. are the first priorities for an employment oriented pattern of growth.

In the context of yield increasing technical change, judiciously selected mechanization may be necessary to both the increase in agricultural production as well as to direct increases in employment. This is because labor bottlenecks at certain seasons may prevent acceptance of new crop varieties or cropping patterns which would not only increase production and income, thereby supporting employment in other sectors of the economy, but which would directly increase employment at other seasons in agriculture as well. Thus, in a linear programming analysis in Mysore state, India,it is shown that power tiller mechanization allows a substantial increase in production and intotal employment by breaking seasonal labor bottlenecks to increased cropping intensity. Of course the full distribution implications of such mechanization also depend on the underlying structure with respect to land tenure and control of inputs. For this reason, mechanization policy is particularly complex, requiring knowledge of labor supply and its seasonality as well as technical requirements for crops. In the long run considerably more research is needed to facilitate sound policy. In the short run, the complexity of the situation may require emphasis on the market mechanism and prices to regulate the growth of mechanization. In that case it is important that substantial subsidy to mechanization not be inadvertently implemented through credit and import and foreign exchange policies.

Again, once income and production increasing technical change for the basic food crops is underway increased production of nonfoodgrain agricultural commodities, such as vegetables and livestock products, becomes an early priority in an employment oriented strategy. This is because they are labor intensive in their production, providing a major potential for increased employment as incomes rise and a high proportion of increments to income are spent on these commodities. In simulation analysis of high employment growth patterns, approximately half the increase in agricultural employment occurs in this sector. Several important policy implications follow.

Realization of the employment and growth potential in the nonfoodgrains agricultural sector requires growth in comsumer expenditures, as it is necessarily a demand led growth, dominated by commodities with elastic demand patterns. That same characteristic implies growth in demand for nonagricultural commodities as well, providing a joint stimulus to several sectors of the economy. Because the demand for nonfoodgrain agricultual commodities also tends to be highly responsive to price, rising relative prices will shift consumption readily to other commodities, thereby losing the employment potential of this sector. Thus, it is important that agricultural policy be developed to remove the production and marketing bottlenecks in these sectors. Since breakthroughs in the basic food commodities may occur rapidly, a forward looking rural development strategy will give early attention to livestock and vegetable production and marketing problems. Further, in a rural oriented strategy much of the growth in demand for such commodities will be in the rural areas themselves, requiring a further reorientation of marketing institutions and policy.

2. Fostering the Small Farmer

Improving the conditions of the small farmer is important in its own welfare context and in order to prevent his falling into the even poorer landless labor class, thereby further exacerbating the problems of that class. The small farmer problem interacts closely with both technical change in agriculture and with various aspects of employment policy.

Increasing participation of the small farmer in growth requires two major thrusts -- first, facilitating his application of high yielding technology, and second, fostering production of labor intensive commodities. The first requires policy to deal with the special problems of the small farmer in adopting new technology and its associated inputs, while the second additionally requires policy to foster increased production.

The small farmer often has difficulty in obtaining capital necessary to application of high yielding farm technology; but, even more important, he faces serious problems of risk and uncertainty aversion which make him reluctant to borrow or to innovate even when other conditions are favorable. Thus, small farmers frequently choose lower income but more stable crop combinations and technologies. This was exemplified in a study of farmers in Gujarat state, India, in which the small farmers chose cropping patterns which, compared to the larger farmers, reduced the variation in their income, but at the cost of Rs. 100 in average income for each Rs. 100 reduction in variance.

Thus, policy to reduce uncertainty and to increase farmer's ability to absorb risk are important to improving incomes of small farmers. These policies may include orientation of research to reduce risk and uncertainty; providing small farmers access to credit on terms which reduce risk and uncertainty; as well as development and provision of income stabilization schemes. The important point for policy is that simply providing access to credit may not be a sufficient condition for wide spread small farmer participation in income increasing technology.

In addition to risk and uncertainty problems and credit constraints, the small farmer may lack access to critical inputs such as fertilizer due to their general scarcity and consequent control of distribution by larger farmers. The solution to this problem lies primarily with eliminating scarcity of such critical inputs.

The small farmer earns his income more from the labor of his family than from his small piece of land -- he is thus in part a landless laborer and in part a landowner, but weighted towards the laborer. It is for this reason that the labor intensity of farming is so important to the small farmer and it is here that important interactions occur with other elements of development strategy. The farm enterprises which offer the greatest opportunity for increased labor intensity -- livestock products such as milk, vegetables and some types of fruits, have highly elastic demand. Unless consumer expenditure generally is rising there will not be a favorable demand and price context for major increases in production of such commodities. Thus, the absorptive capacity of agriculture for labor is very much influenced by the level of and growth of consumer incomes. Thus in a simulation model, a substantial proportion of increased employment in agriculture occurs in nonfood-grain agriculture, if overall incomes are rising rapidly.

It should be noted that expanding consumer expenditure for demand elastic agricultural commodities will be accompanied by commensurately large, or larger, increase in demand for nonagricultural consumer goods which also have elastic demand and which also have a potential for substantial labor absorptive capacity. Thus we see a crucial set of interactions. Large increases in productivity in foodgrains production are required to provide both the most basic wages goods to back increased employment and a portion of the increased income to purchase nonfoodgrain agricultural commodities, while growth must also occur in the nonagricultural sectors to reinforce the demand growth and to provide complementary consumer goods. Thus, much can be done to increase employment in agriculture and particularly employment and incomes of small farmers -- but only in the context of a set of major, employment related developments in other sectors of the economy.

Unfortunately, small farmers face the same set of problems in increasing intensity of farming through nonfoodgrains agricultural production as in adopting new high yield foodgrains. Labor intensive activities are normally intensive in requirements of working capital and the risk and uncertainty from weather and pest effects on yields and price instability tend to be especially high. Thus small farmers often avoid the labor intensive enterprise combinations which, on the surface, seem best suited to them. The policy needs are several. First, a research emphasis to reduce yield uncertainty of labor intensive enterprises through greater pest resistance and control and tolerance to weather fluctuations. Second, improved credit facilities to meet the high risk conditions of such enterprises. Third, improved marketing and processing facilities to reduce price fluctuations and risks.

3. Fostering Small Scale Industry

Expansion of small scale industry offers potentials closely related to those in nonfoodgrains agriculture and can be seen as highly complementary to employment oriented policies for agriculture. Rising income in rural areas may itself create a favorable demand environment as well as a source of savings and investment. Concurrently, small scale industry may tap sources of savings not otherwise available for industrial expansion. Detailed analysis of small scale firms shows them (1) to be labor intensive; (2) to have large working capital requirements relative to their fixed capital requirements (while lending systems tend to be more oriented to providing loans on security of fixed capital); (3) to use large quantities of raw materials relative to fixed capital, requiring finance and making them vulnerable to price fluctuations in raw material markets, the latter, in turn, placing emphasis on trading acumen and favoring the trader as entrepreneur in small scale industry; (4) to require raw materials, such as steel, plastics and fibres, which themselves tend to be capital intensive, requiring imports if the labor intensive advantages of small scale industry are not to be substantially lost.

Thus, growth of small scale industry complements vigorous agricultural development policy by providing employment and hence increased incomes and demand for food and other agricultural commodities and by providing a potential investment outlet. However, vigorous development of small scale industry requires supporting policy of improved infrastructure for better working markets, imports of capital intensive raw materials and intermediate products, ready supply of working capital and rising consumer income. Such an environment seems consistent with an agriculture and employment oriented strategy of growth but not with the capital intensive strategies recently so favored in the literature of economic growth.

4. The Potentials and Role of Integrated Rural Development

Integrated rural development becomes a desirable and feasible proposition in the context of income increasing technological change in basic agriculture and the market town concept as a development unit then becomes an important conceptual approach. It is through such a set of integrated developments that major increases in rural employment may occur. However, these changes hinge very much on the initial technological breakthroughs in basic food production -- the "green revolution." It is the increased income from the initial technological breakthroughs which provide increased demand for transport, for increased agricultural output, for producer goods such as fertilizer and for consumer goods; for electrification for both production and consumption purposes; as well as for other elements of rural infrastructure. Increased rural incomes and demand, greater potential for rural investment and improved rural infrastructure then create an environment favorable for small scale industry which, in turn, fosters employment and resources to help pay for rural infrastructure.

Thus, we see agricultural production, consumption and rural industry providing a basis to support rural infrastructure which no one alone could support. The implications of this set of relationships to total development strategy are profound. Given the massive initial size of the rural sector, widespread success in integrated rural development will require a high proportion of the economy's physical and financial resources. Thus, for the total approach to succeed requires a major reorientation of development strategy. Again, a partial commitment to an employment oriented strategy is not likely to succeed.

The basic policy needs are a commitment to technological change in agriculture as the engine of growth, to investment in rural infrastructure, including roads and electrification on a massive scale, and to fostering small scale rural industry as indicated above.

5. The Role of Rural Public Works

The foregoing analysis facilitates placing the role of rural public works in perspective. It can be seen that without major ancillary efforts at rural development, public works programs cannot fulfill the function of providing a major source of employment and real income for the low income laboring classes. With vigorous rural development, rural public works will be needed for productive purposes and perhaps need fill no more than a residual role in providing employment.

Rural public works programs may provide a major source of employment in pilot project areas without affecting aggregate demand for food significantly. But, if a public works program is national in character and affects a major portion of the laboring class and the employment problem, then it necessarily has a substantial impact on the demand for food and for grain, in particular. It is the high marginal propensity of poor people to consume food that creates this relationship and makes vigorous growth in food supplies a necessary condition of a vigorous employment program. But, that very growth in food output, increases employment directly, and provides income flows which indirectly increase employment and through this set of processes creates an effective demand for increased rural infrastructure. In this context, rural public works are properly viewed first, in their productive capacity of providing the infrastructure of rural development and secondarily, as dealing with a small scale, hard core problem of unemployment and poverty within a generally expansionary employment context. It is the necessarily supplemental role of rural public works which has been missed in much of current policy discussion.

6. Regional Development Problems and Prospects

Backward regions remain the most intractable problem of employment and growth in a rural oriented growth pattern. A region which is unable to apply new agricultural technology and to experience vigorous rural growth suffers a dual disadvantage in mitigating problems of employment and poverty. First, agriculture itself does not serve as a major direct and indirect source of expanded employment; second, the area itself can provide neither the resources nor the effective demand for the infrastructure created by rural public works. Conversely, such infrastructure is both in heavy demand and can be paid for in an advancing area. Thus, rural oriented growth is likely to establish and greatly widen reginnal income disparities.

The dilemma thus arises as to whether investment is better placed initially in the areas with production potential, relying on growth in demand for labor in such areas to provide employment for the lagging area through migration or to eventually provide large funds for infusion into the lagging area. Linear programming analyses for Mandya district, India, suggest substantial potential for increased employment by concentration of investment in more responsive areas and using labor migration to break labor bottlenecks and to relieve

poverty in the backward areas. These processes also allowed migration of labor to substitute effectively for mechanization in breaking seasonal labor bottlenecks. However, the dilemma of the social welfare implication of facilitating growth in such regional income disparities remains.

7. Agricultural Price Policy

Relative agricultural prices play a major role in indicating the balance between employment policy and food production policy. Rising relative agricultural prices indicate that employment and real incomes of the low income people with elastic demand is increasing faster than food production and that failure to accelerate food production growth will require slowing of employment growth. Conversely, declining relative food prices suggest potential for accelerating employment growth without inflationary effects and indicates a need for direct and indirect stimulation of employment through public policy. Similarly, rising relative prices of potentially employment intensive commodities, such as livestock products and vegetables, indicate that production or marketing constraints are inhibiting growth and provision of employment and of course signal the need for public policies to remove the inhibitions to growth of these highly desirable sectors.

Special price problems arise with respect to the small farmer. His particular vulnerability to risk and uncertainty argue for programs to shield him from fluctuations in output prices. However, it must be remembered that for the small farmer with a major element of subsistence production, stabilization of prices of the basic grain commodities tends to destabilize income. For the small farmer, who sells only a small proportion of output, the low income years are the low production years -- price stabilization prevents prices rising as much as they would otherwise in such years and reduces the prices offset to lower production. In contrast, for the income elastic commodities such as livestock and vegetables, the small farmer may well sell as large or even a larger proportion of production than the large farmer, but stabilization of prices of perishable commodities may be exceedingly expensive except through programs of improved marketing, including storage and transportation. Of course, the sharp increase in use of puchased inputs makes farmers much more vulnerable to swings in relative market prices as well as making production generally more responsive to the average level of prices.

Sound public policies with respect to prices will focus first on prices as important indicators of underlying problems which must receive attention if growth and distribution objectives are to be met; and second, on the role price policy can play in providing favorable incentives for cost decreasing, efficiency increasing technological change.

It should be noted that public policy may inadvertently add to price distortions which interfere with social objectices. Subsidies for labor saving mechanization, for example, not only encourage uneconomic mechanization but may divert attention and allocate resources away from the types of mechanization which break employment bottlenecks and thereby increase total employment. Similarly, attempts to reduce prices of particular commodities is likely to result in distortion of production patterns towards unaffected products or to distort marketing channels in less efficient directions.

8. Land Reform and Multiplier Effects

A relatively even size distribution of land ownership will normally be a necessary condition to obtaining the favorable indirect, linkage effects upon employment growth of the technological change in agriculture. Thus, land reform may be necessary to the favorable working of these processes. This conclusion follows from the importance of consumption patterns by land owners that emphasize relatively labor intensive type commodities and the tendency for such patterns to prevail among peasant owner-cultivators, but not amongst wealthy owners of large land holdings. It seems likely that where land ownership is highly concentrated the consumption patterns of the land owners tend towards high import content and high capital intensity. Thus, the linkage or multiplier effects emanating from the new agricultural technologies would not stimulate domestic employment growth, nor consequently, growth in demand for the increased agricultural production. The consequence is likely to be programs of subsidized storage or export, or price declines which may remove incentives for increased lproduction.

Preferable for both growth and income distribution would be change in consumption patterns by redistribution of land or, through taxes, the income from land.

These brief comments on land tenure add not only an additional dimension to considerations of land tenure but serve to emphasize a key feature for growth processes related to agriculture -- the role of income distribution, the patterns of consumption expenditure and consequent employment intensity on the structure of growth.

9. Social Welfare Programs in Perspective

Social welfare programs, including health and nutrition, are unlikely to be successful except in a context of vigorous growth of the agricultural sector, but in that context offer considerable scope as ancillary programs. The reasons for this lie with the nature of health deficiencies and the patterns of income distribution of the poor.

It is becoming increasingly clear that the poor in low income countries suffer a lack of basic calorie sources, and that they spend a high proportion of increments to income on these basic calorie sources. Thus, the first requisites of improved diet and health are increased agricultural production and increased income of the poor. If these requisites are met by aggressive rural development, then the food supplies become available along with the requisite purchasing power. Further, the environment becomes improved for rural infrastructure of transport, and electrification which further improves the conditions for building and staffing the institution for supplementary programs of education and direct delivery of health services to target groups of special vulnerability to health and nutrition problems.

10. Rural Education

Rural education, as for health and nutrition, has greater potentials for success in a context of vigorous rural development. The children of the rural poor tend not to attend school in the context of a stagnant rural economy. Under such conditions the returns to education are low. Vigorous rural development provides growth in rural employment opportunities for persons with low levels of education. These opportunities arise not only in firms servicing the production aspects of agriculture but also in firms and sales outlets for the higher quality consumer goods demanded from the higher incomes. Thus investment in rural education may attract lower income participants in a context of expanding employment opportunities, but not in a stagnant rural and employment growth situation.

DN-R1A-043
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